R19

Code No: 861AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA I Semester Examinations, July/August - 2021
COMPUTER ORIENTED STATISTICAL METHODS

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) In a certain assembly plant, three machines, B1, B2, and B3, make 30%, 45%, and 25%, respectively, of the products. It is known from past experience that 2%, 3%, and 2% of the products made by each machine, respectively, are defective. What is the probability that a randomly selected finished product is defective?

b) You enter a chess tournament where your probability of winning a game is 0.3 against half the players 0.4 against a quarter of the players and 0.5 against the remaining quarter of the players you play a game against a randomly chosen opponent. What is the probability of winning? [8+7]

2.a) A random variable X may assume 4 values with probabilities $\frac{1+3x}{4}, \frac{1-x}{4}, \frac{1+2x}{4}, \frac{1-4x}{4}$. Find the condition on x so that these values represent the probability function of X.

b) The joint probability density function of two random variables X and Y is

$$f_{xy}(x,y) = \begin{cases} \frac{5}{16}x^2y & for\ 0 < y < x < 2 \\ 0 & other\ wise \end{cases}$$

Find : i) the marginal density of X and Y ii) Are X and Y are independent? [7+8]

3.a) Find the mean of the random variable whose probability density function is given by $f(x) = 3/5\ 10^{-5}\ (100 - x) \quad 0 \leq x \leq 100$.

b) If X is the number appearing on a die when it is thrown, show that the Chebshev's theorem given $P[\ |X - \mu| > 2.5] < 0.47$, while the actual probability is zero. [8+7]

4.a) Show that mean = variance for a Poisson distribution.

b) Probability of a success is given by 0.4 if n = 8, find the i) $P(x \geq 1)$ ii) $P(0 < x < 4)$. [7+8]

5.a) The lognormal distribution is found to be a good model for strains in structural members caused by wind loads. Let the strain be represented by X, with $m_X = 1$ and variance of X is 0.09. (i) Determine the probability $P(X > 1\ 2)$. (ii) If stress Y in a structural member is related to the strain by $Y = a + bX$, with $b > 0$, determine $f_Y(y)$ and m_Y.

b) The life of a power transmission tower is exponentially distributed, with mean life 25 years. If three towers, operated independently, are being erected at the same time, what is the probability that at least 2 will still stand after 35 years? [8+7]

6.a) Take 30 slips of paper and lable 5 each -4 and +4, lable 4 from each -3 and 3, three each -2 and 2 and two each -1, 0, and 1. If each slip of paper has the same probability of being drawn, find the probabilities of getting -4,-3,-2,-1,0,1,2,3,4 and find the mean and the variance of this distribution.

b) Find the probabilities that a random variable having the standard normal distribution will take on a value i) Between 0.87 and 1.28 ii) between -0.34 and 0.62. [7+8]

7.a) A manufacturer of electric lamps is testing a new production method that will be considered acceptable if the lamps produced by this method result in a normal population with an average life of 2,400 hours and a standard deviation equal to 300. A sample of 100 lamps produced by this method has an average life of 2,320 hours. Can the hypothesis of validity for the new manufacturing process be accepted with a risk equal to or less than 5%?

b) Among 200 items 50 are defective and from another sample among 400 items 80 are defective. Test at 0.05 level whether there is a significant difference between the proportions. [8+7]

8.a) Find the linear least square fit $y = a\,x + b$ for the experimental data points given by: {(1 , 2) , (3 , 4) , (2 , 6) , (4 , 8) , (5 , 12) , (6 , 13) , (7 , 15)}

b) The following regressions equations were obtained from a correction table

$y = 0.516x + 33.73$ $x = 0.512y + 32.52$

Find the value of i) The correlation coefficient ii) The mean x's iii) the mean of y's. [7+8]

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